DEPARTMENT OF ENERGY HEADQUARTERS—OFFICE OF NUCLEAR WASTE MANAGEMENT

On February 12, 1980, President Jimmy Carter established this nation's first comprehensive radioactive waste management program by presenting a policy statement to Congress. Excerpts from the statement are presented as part of this report because of the policy's impact on the Department of Energy's nuclear waste management activities.

Excerpts from the President's Policy Statement

. . . My actions today lay the foundation for both a technically superior program and a full cooperative federal-state partnership to ensure public confidence in a waste management program.

My program is consistent with the broad consensus that has evolved from the efforts of the Interagency Review Group on radioactive waste management (IRG) which I established. . . .

My objective is to establish a comprehensive program for the management of all types of radioactive wastes. My policies and programs establish mechanisms to ensure that elected officials and the public fully participate in waste decisions, and direct Federal departments and agencies to implement a waste management strategy which is safe, technically sound, conservative, and open to continuous public review. . . .

Our primary objective is to isolate existing and future radioactive waste from military and civilian activities from the biosphere and pose no significant threat to public health and safety. . . . The technical program must meet all relevant radiological protection criteria as well as all other applicable regulatory requirements. This effort must proceed regardless of future developments within the nuclear industry. . . . The specific steps outlined below are each aimed at accomplishing this overall objective.

. . . My administration is committed to providing an effective role for state and local governments in the development and implementation of our nuclear waste management program. I am therefore taking the following actions:

- . . . I am establishing a state planning council which will strengthen our intergovernmental relationships. . . .

- In the past, states have not played an adequate part in the waste management planning process. . . . The states need better access to information and expanded opportunity to guide waste management planning. Our relationship with the states will be based on the principle of consultation and concurrence in the siting of high-level waste repositories. Under the framework of consultation and concurrence, a host state will have a continuing role in Federal decision making on the siting, design and construction of a high-level waste repository. . . . The safe disposal of radioactive waste, defense and commercial, is a national, not just a Federal, responsibility.
- I am directing the Secretary of Energy to provide financial and technical assistance to states and other jurisdictions to facilitate the full participation of state and local government in review and licensing proceedings.

. . . For disposal of high-level radioactive waste, I am adopting an interim planning strategy focused on the use of mined geologic repositories capable of accepting both waste from reprocessing and unreprocessed commercial spent fuel. . . . In its search for suitable sites for high-level waste repositories, the Department of Energy has mounted an expanded and diversified program of geologic investigations that recognizes the importance of the interaction among geologic setting, repository host rock, waste form and other engineered barriers on a site-specific basis. Immediate attention will focus on research and development, and on locating and characterizing a number of potential repository sites in a variety of different geologic environments with diverse rock types. When four to five sites have been evaluated and found potentially suitable, one or more will be selected for further development as a licensed full-scale repository.

It is important to stress the following two points: First, because the suitability of a geologic disposal site can be verified only through detailed and time-consuming site specific evaluations, actual sites and their geologic environments must be carefully examined. Second, the development of a repository will proceed in a careful step-by-step manner. Experience and information gained at each phase will be reviewed and evaluated to determine if there is sufficient knowledge to proceed with the next stage of development. We should be ready to select the site for the first full-scale repository by about 1985 and have it operational by the mid-1990s. For reasons of economy, the first and subsequent repositories should accept both defense and commercial wastes.

Consistent with my decision to expand and diversify the Department of Energy's program of geologic investigation before selecting a specific site for repository development, I have decided that the Waste Isolation Pilot Plant project should be cancelled. This project is currently authorized for the unlicensed disposal of transuranic waste from our national defense program, and for research and development using high-level defense waste. This

project is inconsistent with my policy that all repositories for highly radioactive waste be licensed, and that they accept both defense and commercial wastes.

Over the next five years, the Department of Energy will carry out an aggressive program of scientific and technical investigations to support waste solidification, packaging and repository design and construction including several experimental, retrievable and emplacements in test facilities. This supporting research and development program will call upon the knowledge and experience of the nation's very best people in science, engineering, and other fields of learning and will include participation of universities, industry, and the government departments, agencies, and national laboratories.

. . . Storage of commercial spent fuel is primarily a responsibility of the utilities. I want to stress that interim spent fuel storage capacity is not an alternative to permanent disposal. However, adequate storage is necessary until repositories are available. I urge the utility industry to continue to take all actions necessary to store spent fuel in a manner that will protect the public and ensure efficient and safe operation of power reactors. . . .

. . . It is essential that all aspects of the waste management program be conducted with the fullest possible disclosure to and participation by the public and the technical community. I am directing the departments and agencies to develop and improve mechanisms to ensure such participation and public involvement consistent with the need to protect national security information. The waste management program will be carried out in full compliance with the National Environmental Policy Act.

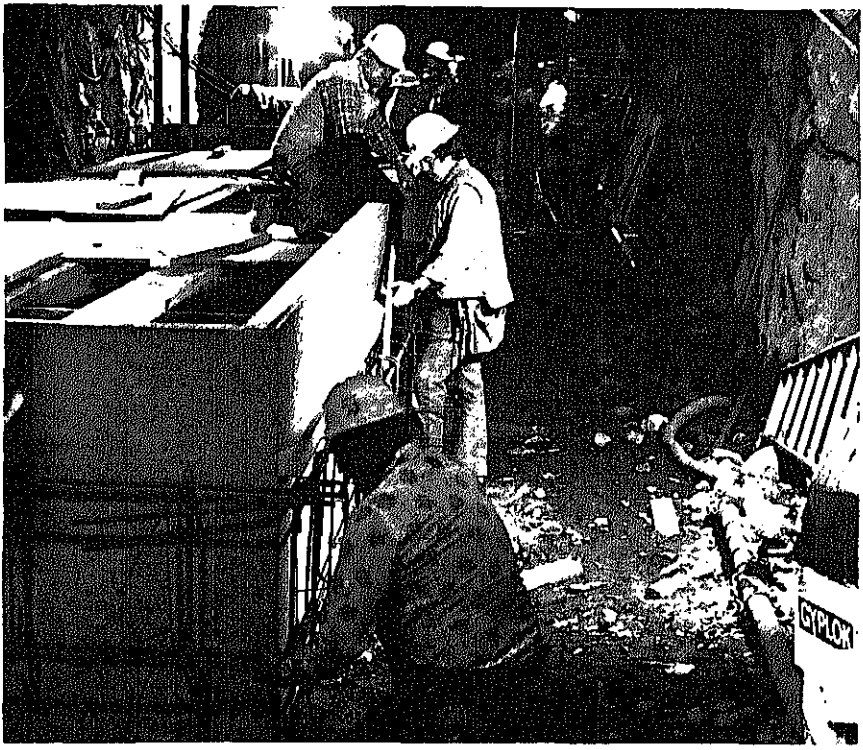
In its role as lead agency for the management and disposal of radioactive wastes and with cooperation of the other relevant Federal agencies, the Department of Energy is preparing a detailed national plan for nuclear waste management to implement these policy guidelines and the other recommendations of the IRG. This plan will provide a clear road map for all parties and will give the public an opportunity to review the entirety of our program. It will include specific program goals and milestones for all aspects of nuclear waste management. A draft of the comprehensive national plan will be distributed by the Secretary of Energy later this year for public and congressional review. The State Planning Council will be directly involved in the development of this plan.

BASALT WASTE ISOLATION PROJECT (BWIP)

Near-Surface Test Facility

The mining construction portion of the Near-Surface Test Facility (NSTF) was completed in September, 1979, and test equipment is being installed. The NSTF is being developed as a full-scale demonstration to determine the effects on basalt of heat that would be emitted by nuclear waste.

Three 700-foot tunnels forming a double-U-shaped cavern have been drilled and blasted out of the side of Gable Mountain, located at the center of DOE's Hanford Site, near Richland. During the nearly 15 months of



Workmen construct an instrument enclosure for computer equipment that will measure and record data collected from heater tests at the BWIP Near-Surface Test Facility.

Wiring to light the tunnels in the Near-Surface Test Facility and to provide electricity for computer equipment and heater testing equipment is being installed at the Hanford Site on Gable Mountain.

tunnel excavation, the construction force of more than 60 men from Genstar Construction Company removed basaltic rock equivalent to a roadway 7 miles long, 18 feet wide, and 3 feet deep.

The "jumbo" drilling machines and dump trucks called "muckers", used during excavation, have been pulled out. A crew of about 30 technicians and electricians from the J. A. Jones Construction Company has begun the intricate work of installing sophisticated sensory instrumentation devices for the heater tests. More than 30 BWIP engineers and staff members have recently moved to the NSTF site.

A number of 18-foot heaters, to be placed in vertical core holes drilled in the basalt, will simulate the thermal output of spent fuel. Before and after

the heaters are in place, the physical properties and thermal stresses of the basalt will be measured by scientists using sensory instruments. The data gathered will then automatically be compiled and stored in computer facilities located at the site.

The scientists expect to begin the heater test in June, 1980. A future series of tests will use two canisters of radioactive spent fuel and one canister of vitrified commercial high-level waste, rather than heaters.

Results from the studies here are of major importance in assessing the feasibility of siting a repository in basalt. Hydrologic studies, engineered barriers studies, and geoscience studies will also contribute significantly to the analysis of the data to be collected.

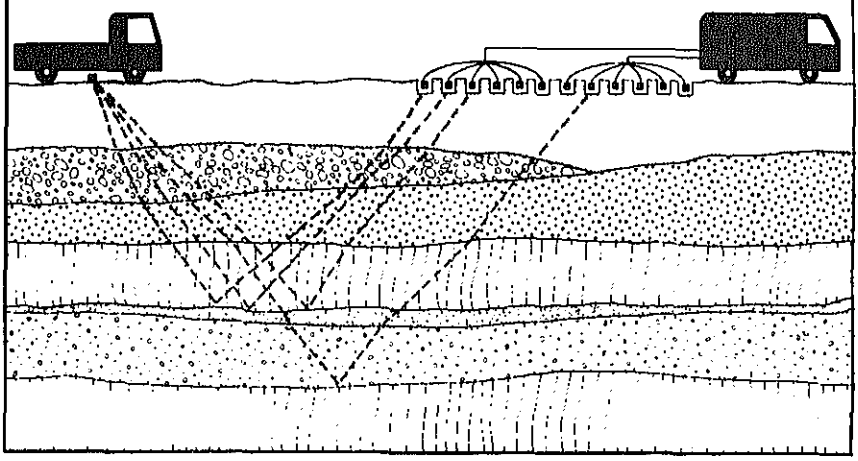
Current timetables show the NSTF testing and evaluation to be complete in the mid 1980s. Pending a decision to proceed with siting and licensing of a repository in basalt, a repository could be constructed and operational in basalt around the year 2000.

Oil Field Technology Used at Hanford

Oil field technology, normally used to locate underground oil and gas reserves, is being applied to investigations of the Basalt Waste Isolation Project. Seismic reflection surveying is being employed to supplement test hole drilling to gain information about the structure of basalt flows beneath the Pasco Basin. This method has been used for several decades in the oil industry.

Seismic reflection surveying is based on the principle of acoustic or sound energy reflecting from the various layers of rock or sediment underground. Surface generated energy is reflected back to the surface by different layers much as an echo occurs in a canyon. By measuring the travel time to and from the reflector, the depth of the layer is indicated.

Rockwell Hanford Operations' geologists are presently studying both the surface and subsurface geology of the Pasco Basin and Columbia Plateau. Interpretation of surface mapping can lead to a subsurface model. However, definitive information must be obtained to verify the model. Drill holes into the subsurface provide spot verification, but extrapolation is necessary to provide detail between the holes. Geophysical surveying is a method of obtaining such continuous data.



Artist's cross section illustrates seismic reflection surveying of basaltic strata, a method in use at BWIP. Energy impulses (dashed lines) are transmitted by individual geologic structures (layers) underground and reflected back to sensing devices where they are recorded. The recordings are then decoded by computers to show rock layer positions and other geologic phenomena.

To ensure that the seismic reflection technique would provide the best possible data to the program, thorough testing was conducted during 1978 when the method was tested at three separate locations near drill holes on the Hanford Site. Based on the results of this testing, seismic surveys were planned in 1979 using the VIBROSEIS®* technique to detail the subsurface basalt structure.

A total of more than 110 miles of seismic surveying has been run on the Pasco Basin over several routes. The areas were chosen that should initially yield the greatest amount of information necessary for the understanding of the subsurface.

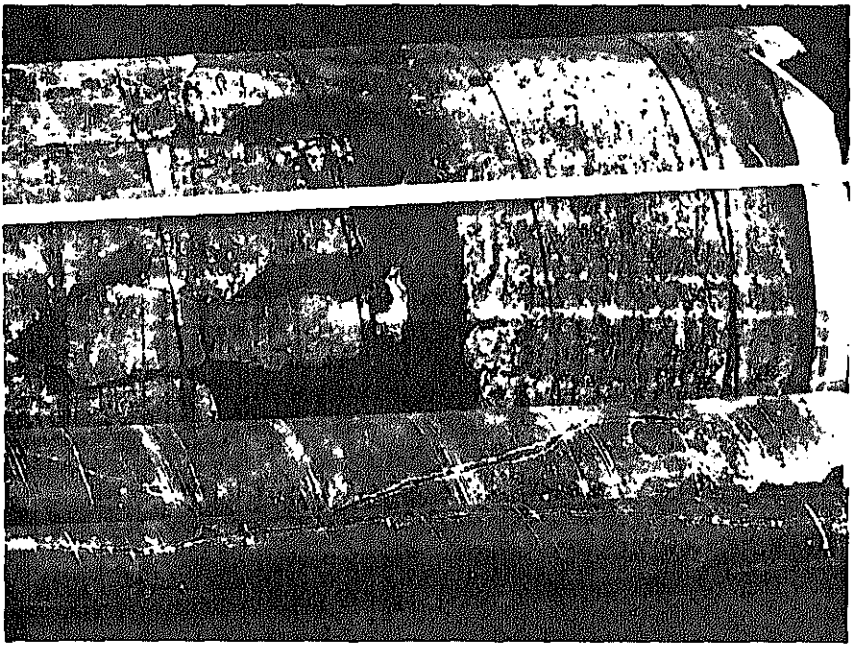
Seismic reflection, however, is not an isolated study. Gravity studies, magnetic surveys, and electrical prospecting are among the more common geophysical methods being used by the geological and geophysical staff.

Based on the results of the reflection seismic surveying carried on so far on the Hanford Site, geophysical methods show great potential for assisting the geologists and the engineers in their evaluation of the Hanford Site as a candidate for a potential repository site.

*Trademark of the Continental Oil Company.

Impression Packers Used at Near-Surface Test Facility

More than 630 feet of core holes drilled in basalt at the Near-Surface Test Facility have been tested with a device known as an "impression packer". Until recently, impression packers were used primarily in the oil industry as a means of detecting cracks and leaks in oil rig drill pipe. However, the NSTF has utilized impression packers on a new, larger scale, as a means of measuring and recording the changes in basalt caused by heat generated from heater tests and spent fuel tests. This use of impression packers at the NSTF is the largest technical use of such equipment in the



At first glance, these three cylinders resemble drill cores—but they are not. Instead, the photo shows three impression packers after their removal from drilled core holes. Impression packers are testing devices being used to measure fractures and imperfections in basalt core holes at the Near-Surface Test Facility. Impressions are taken in 5-foot lengths ranging from 3 to 18 inches in diameter. Soft, pliable rubber is wrapped around a metal cylinder and pressurized. This pressure forces the rubber into the cracks of the basalt, resulting in a molded impression. Impressions can be taken before, during, and after heater scientists with valuable information concerning the basalt repository. (The long white strip is a tape

world. The $100,000 contract was awarded to TAM Packer International of Houston, Texas. TAM designed the packers and related operating equipment specifically for the large-scale operation at the NSTF.

Impression packers in use at the NSTF range in size from 3 inches in diameter to 18 inches in diameter. All consist of a hard rubber inner cylinder or sleeve, which is wrapped with a soft natural rubber substance. Impressions are taken by lowering the wrapped sleeve into a core hole and pumping nitrogen gas into the sleeve until the internal pressure reaches 100 pounds per square inch (about seven times the atmospheric pressure of the earth). The pressure forces the pliable rubber into the fractures and cracks in the basalt. After 10 minutes, the pressure is released and the packer is removed and baked or cured in an oven, making the impressions in the rubber permanent.

To date, impressions have been taken in the heater test room, which will house electric heaters that will simulate the thermal output of spent fuel. The data collected from these heater tests will be compiled and recorded in the computer facility located on the NSTF site for future analysis.

Impressions are taken in 5-foot lengths and visually evaluated. They will be compared to impressions taken during and after the heater tests. The data will determine if there are any significant changes or new fractures in the basalt core holes. Impressions of fractures and changes can be measured to 1/300 of an inch, which will enable scientists to supply specific information for input into the decision of whether or not a nuclear waste repository is feasible in basalt.

NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS (NNWSI)

The DOE's Nevada Nuclear Waste Storage Investigations (NNWSI) consist of a variety of experiments, studies, and tests in support of the U.S. Nuclear Waste Management Program. These investigations are being conducted by the Los Alamos Scientific Laboratory (LASL), the Lawrence Livermore Laboratory (LLL), Sandia Laboratories (SL), and the U.S. Geological Survey (USGS). Primary support is being provided by DOE's Nevada Test Site (NTS) contractors and the Westinghouse Electric Company (WEC). The NNWSI are being coordinated by DOE's Nevada Operations Office (NV). The NNWSI were formally organized in 1977 and are primarily oriented towards performing nuclear waste isolation research and development work and evaluating selected underground rock masses on or adjoining the NTS to assess their suitability for hosting a commercial high-level nuclear waste repository.

The NNWSI are generating both site-specific and regional geologic and hydrologic data. A comprehensive scientific data base is being developed to determine whether radionuclides from a breached repository can migrate, and, if so, at what rates, for what distances, and by which pathways. Data are being obtained that will indicate the long-term effects of heat and radiation on the host rock. In addition, experiments and tests are being conducted at the NTS to improve radioactive waste encapsulation techniques and to determine the reliability of nuclear waste storage technologies.

Specific host-rock masses are being evaluated to determine their acceptability as storage media for highly radioactive solid wastes. Whether a rock mass is acceptable or not depends primarily on its physical, chemical, and mechanical properties. These properties are being determined and evaluated in both laboratory and field studies. The resulting data are being used to develop models for predicting how well a repository would perform its mission over its intended life-span. One predictive technique being used involves establishing test facilities within selected rock masses and measuring rock behavior under test conditions. At the present time, the NNWSI are actively evaluating granitic and tuffaceous media and are documenting the final results of experimentation with argillite at the NTS.

An in situ test of the current technology for storing heat-generating radioactive wastes in granite 1,400 feet underground is scheduled to begin in April, 1980. This test is known as the Spent Fuel Test – Climax. Some of the

facilities previously constructed for nuclear weapons effects studies at the NTS are being used for this experiment because they provide access to a large granitic rock mass within the depth range being considered for ultimate geologic disposal. A newly mined underground facility was developed in the adjacent granite and was instrumented to measure the performance of this host-rock medium which is generically representative of crystalline rock formations that exist in many areas of the United States. The response of granite to nuclear waste of high radiation and thermal output is being studied to develop models which can be used for designing nuclear waste repositories.

In the Spent Fuel Test --Climax, there are 11 storage holes for spent fuel canisters and 6 identical storage holes for electrically heated canisters that match the fuel canisters in thermal characteristics. The response of the granite to the electrically heated canisters will be compared with the response of the granite to the canisters containing the spent fuel assemblies to assess the effects, if any, of intense radiation on the behavior of the granitic host-rock medium. A heater drift is located on each side of the spent fuel canister drift; each of these drifts is equipped with electric heaters which will produce a thermal situation in the spent fuel canister drift that simulates hypothetical central repository conditions. The spent fuel assemblies were encapsulated in experimental canisters for emplacement in underground granite holes. The spent fuel canisters and the granitic host rock will be monitored for the entire test period, which is expected to span several years.

A short-term underground heater experiment in welded tuff was begun in January 1980 in the G-Tunnel complex at the NTS. This in situ experiment will provide data on water behavior and migration in welded tuff under the influence of a thermal field. These data are needed to elucidate the near-canister environment in welded tuff. Intrarock temperature changes, fluid migration, and reconfigurations will be measured. This experiment is the forerunner of more extensive in situ experimentation to be conducted in subsequent fiscal years.

On the basis of a USGS evaluation of the geologic, geophysical, and hydrologic data from preliminary investigations of several areas at the NTS, the search for a suitable repository site was focused on the tuffaceous media of the Yucca Mountain area where investigations began in FY 1978. Both field and laboratory investigations have been intensified on characterizing the subsurface environment of the Yucca Mountain area. A major stratigraphic exploration hole is being drilled 6,000 feet into Yucca Mountain. Data resulting from detailed analyses of the drill core and related data obtained in the hole will be correlated with the data obtained from previous holes and geophysical reconnaissance data.

OFFICE OF NUCLEAR WASTE ISOLATION (ONWI)

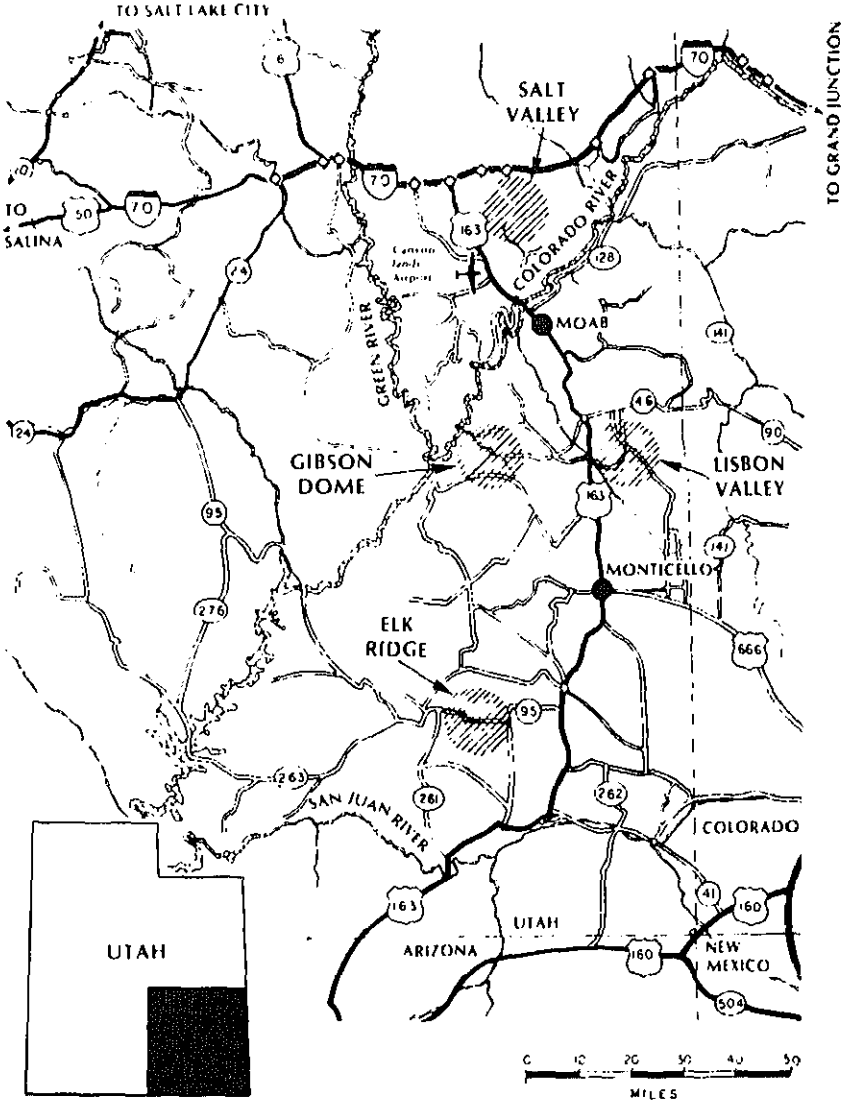
In the section that follows, ONWI reports on a wide variety of NWTS-related activities- geologic exploration and its expansion; assistance in NRC confidence rulemaking; the preparation of the Earth Science Technical Plan, NWTS program criteria, and six program plans; the establishment of WRIT and WIPAP; continued work on the Preliminary Information Report; the establishment of four peer review committees; progress on field tests; and international cooperation.

Exploration Activities in Salt Deposits

Consistent with the President's policy, a repository site will be selected only after four or five sites in a variety of rock types have been evaluated and found to be potentially suitable. Following a 1957 recommendation of the National Academy of Sciences—National Research Council, investigations of salt deposits have been under way longer than for any other rock types. Specific explorations that will help determine the site selection are under way in the Paradox Basin (Utah) and in Gulf Interior salt domes (Texas, Louisiana, and Mississippi), as described below (see maps):

Paradox Basin: Drilling and other field work in Utah, being performed by the U.S. Geological Survey and Woodward-Clyde Consultants, began in Salt Valley in FY 78 and is planned for Gibson Dome and Elk Ridge in FY 80. The field program in these areas consists of a drilling program in each area of interest, supplemented by seismic reflection surveys, limited geologic mapping, evaluation of lineaments by use of remote sensing data, and installation of a microseismic network to collect data on microearthquakes that might be related to specific structural features.

Gulf Interior: Of seven salt domes under active consideration, by late FY 80 or early FY 81 two are scheduled to be recommended for continuing study. The field program being conducted on the salt domes is directed toward an evaluation of the hydrologic and tectonic stability of the domes themselves, as well as an evaluation of the deep ground-water regime of the geologic basins in which the salt domes occur. In the exploration phase currently under way, one core hole is being drilled in each dome, and at least two hydrologic test holes are being drilled on the flanks of each dome. The drilling program is being supplemented by seismic reflection surveys to better characterize the structure of the flanking sediments, by a shallow drilling program over the dome to evaluate any possible warping of



In the Paradox Basin, Utah, exploration activities are under way or planned in three of these shaded study areas—Elk Ridge, Gibson Dome, and Salt Valley.

Left.

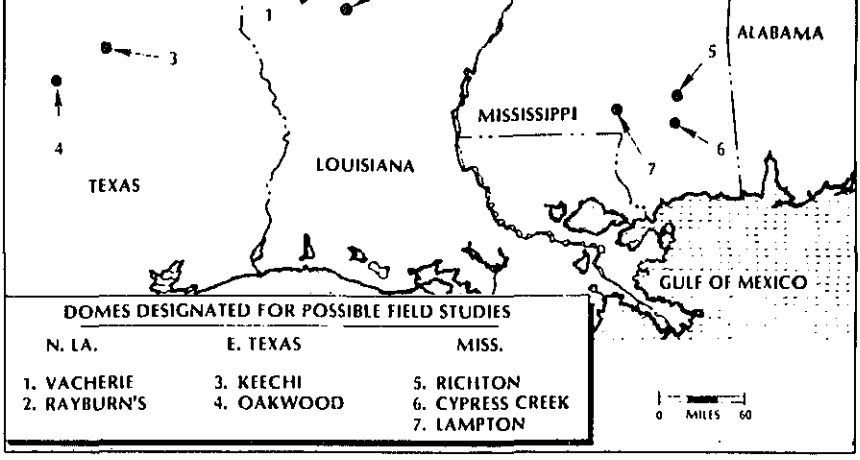
A drilling rig at Cypress Creek Salt Dome in Perry County Mississippi, assists in studies to help determine characteristics of the dome, caprock, and sediment interface as part of studies to evaluate the potential of salt domes as sites for future nuclear waste repositories. Law Engineering and the U.S. Geological Survey cooperated in planning and executing the exploration.

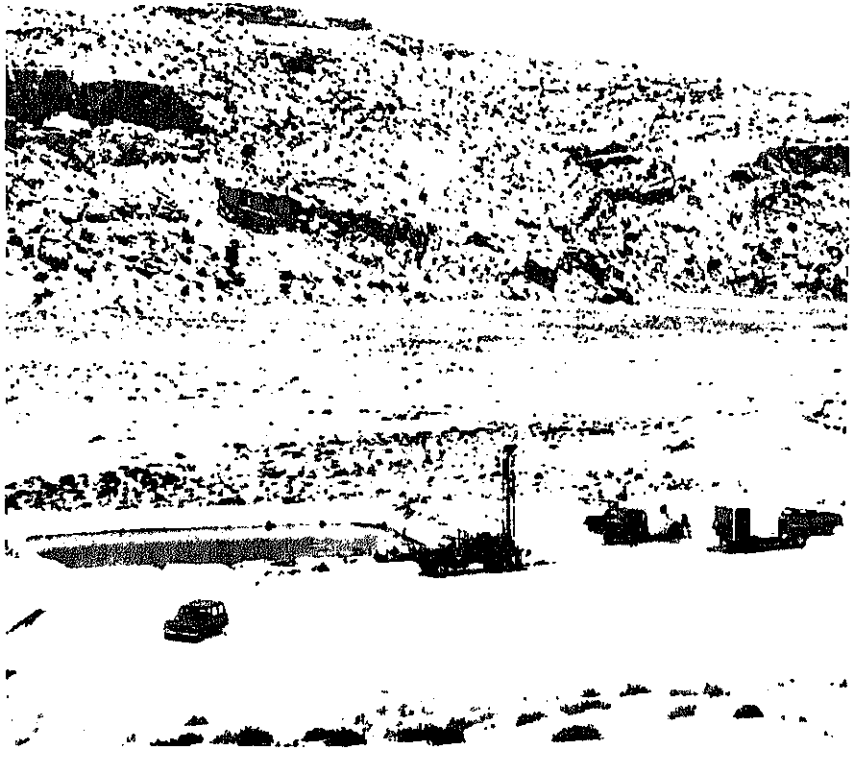
Top right.

Seven salt domes are being studied in Louisiana, Texas, and Mississippi.

Bottom right.

Equipment at Salt Valley in Utah performed vertical seismic profiling to obtain information on the area's subsurface geology, as part of studies to assess the potential of bedded salt deposits as sites for a nuclear waste repository. The work was planned by the U.S. Geological Survey, with technical support provided by Woodward Clyde Consultants.


1
3
4
TEXAS
LOUISIANA
MISSISSIPPI
ALABAMA
5
6
7
GULF OF MEXICO
DOMES DESIGNATED FOR POSSIBLE FIELD STUDIES
N. LA.
E. TEXAS
MISS.
1. VACHERIE
2. RAYBURN'S
3. KEECHI
4. OAKWOOD
5. RICHTON
6. CYPRESS CREEK
7. LAMPTON
0 MILES 60



overlying sediments, by gravity surveys to more precisely delineate the size and shape of the domes, and by an evaluation of remote sensing data to identify any lineaments that may occur in the vicinity of the domes. In some instances, repeated precise leveling has been done over the domes, and tiltmeters have been installed in an effort to identify any possible current uplift. Geologic Program Manager for the work is Law Engineering. Other participants in this activity are the Texas Bureau of Economic Geology in Texas, the U.S. Geological Survey and Louisiana State University in Louisiana, and USGS and the University of Southern Mississippi in Mississippi.

Planned Expansion of Geologic Exploration

President Carter's policy statement on the radioactive waste management program adopts an interim planning strategy focused on the use of mined geologic repositories capable of accepting both waste from reprocessing and unreprocessed commercial spent fuel.

In keeping with this policy, the Department of Energy has mounted an expanded and diversified program of geologic investigations, which will focus on locating and characterizing a number of potential repository sites in a variety of different geologic environments with diverse rock types. To date, these expanded studies have progressed only through the national survey of diverse rock types. Plans for more focussed study of particular regions have not yet been formulated as a basis for discussions with involved states. State consultations will precede the regional siting studies and continue throughout the converging process of identifying sites. When four or five sites have been evaluated and found to be potentially suitable, one or more will be selected for further development as a licensed full-scale repository.

NRC Confidence Rulemaking

DOE plans to present extensive testimony in a "Confidence Rulemaking" hearing to be held by the U.S. Nuclear Regulatory Commission (NRC). The Notice of Proposed Rulemaking announcing this proceeding, 44 Fed. Reg. 61372 (1979), stated the purposes of the proceeding:

"... the Commission has decided to undertake a generic reconsideration of the radioactive waste question so that it can (1) reassess its confidence that safe off-site disposal of radioactive waste from licensed facilities will be available; (2) determine when any such disposal or off-site storage will be available; and (3) if disposal or off-site storage will not be available until

after the expiration of the licenses of certain nuclear facilities, determine whether the wastes generated by those facilities can be safely stored on-site until such disposal is available."

In addition to DOE, more than 50 participants are expected to state their positions to NRC. Participants include state government representatives, environmental groups, federal agencies, and utilities. A proposed rule regarding nuclear waste disposal is expected to be published after all the testimony is heard, possibly late in 1981.

Earth Science Technical Plan

The U.S. Department of Energy (DOE) and the U.S. Geological Survey (USGS) over the past 18 months have jointly prepared the *Earth Science Technical Plan for Disposal of Radioactive Waste in a Mined Repository (ESTP)*. The draft ESTP, which is now ready for a second public review, was prepared by the ESTP Working Group. The Working Group was composed of members from the Waste Isolation Pilot Plant, the Office of Nuclear Waste Isolation, the Nevada Nuclear Waste Site Investigations, the Basalt Waste Isolation Project, DOE, and USGS. ONWI was given the responsibility of coordinating this activity.

The major purpose of the ESTP is to present a plan describing the earth science research and development that must be done to establish a safe mined geologic repository for high-level waste and spent fuel. To that end, it discusses technical questions pertaining to the geologic isolation of radioactive waste, shows how current research tasks relate to these questions, recommends where program emphasis should be placed, and identifies technical questions requiring additional attention. Also the ESTP classifies, describes, and shows relationships among the various earth science research tasks performed by DOE and USGS.

After public comments have been incorporated, the ESTP will be used as a portion of the National Plan for Radioactive Waste Management which is now being prepared.

NWTS Program Criteria

NWTS Program Criteria for Geologic Disposal of Nuclear Waste is being issued in a four-part document scheduled for completion in 1980. The various parts are in various stages of completion and review before being issued. The four parts are described briefly below: *General Program Policies*

and Criteria (ONWI 33-1, not yet available) is intended to provide direction for all NWTS Program efforts (a) by elucidating the program's objectives and key baseline requirements (policies) and (b) by establishing general performance criteria for the waste isolation system and general functional criteria for the site, repository, and waste package components of the system. The functional criteria are presented in further detail in *Site Qualification Criteria* (ONWI 33-2), *Repository Functional Design and Operating Criteria* (ONWI 33-3, not yet available), and *Waste Package Functional Criteria* (ONWI 33-4, not yet available).

Program Plans

Radioactive waste is a critical component in the nuclear fuel cycle. A geologic repository may isolate the waste from the biosphere for thousands or millions of years. As DOE's lead contractor in the National Waste Terminal Storage program, the Office of Nuclear Waste Isolation is preparing or has supervised the preparation of an overall NWTS program plan and five technical plans covering major programmatic activities needed to prepare for the construction of such a repository.

Each technical plan deals with one aspect of the preparation; each will contain an appendix describing current contracted research and development activities under way concerning that topic; and each will explain how that plan interrelates with the other NWTS activities. The plans described below are in various stages of preparation.

National Waste Terminal Storage (NWTS) Program Plan. The NWTS program is charged with developing and implementing technology that will provide safe, environmentally acceptable isolation of commercial nuclear wastes. This plan describes the activities under way and scheduled leading toward attainment of that objective. The plan provides structure and indicates the integration of the efforts of all the NWTS program projects (ONWI, BWIP, NNWSI, Seabed).

Rock Mechanics. This plan describes the NWTS rock mechanics program (ONWI, BWIP, NNWSI) and the key rock mechanics problem areas; outlines current NWTS rock mechanics projects; reports on the development and verification of rock mechanics codes; explains how technology generated in the program will be used; answers remaining rock mechanics questions germane to repository design, siting, and construction; and addresses the interfaces between the rock mechanics program, licensing, and site evaluation.

Waste Package. The objective of the Waste Package Program Plan is to obtain acceptable waste packages on a reasonable time schedule. The purpose of the plan is to describe an orderly interrelated program and its subelements which will result in the development of geologic waste isolation packages for the NWTS program; to provide NWTS program managers with a vehicle to understand, approve, and control the strategy and implementation efforts toward obtaining acceptable waste packages; to provide current and future participants in the development and design of waste packages with an understanding of what the NWTS program managers plan to do and on what schedule; to provide DOE with a basis to determine funding required to support the milestone schedule and measure participant performance and overall program performance; to demonstrate that the waste package effort is integrated with other NWTS program efforts under way to find suitable sites and develop the repository facilities and equipment; and to provide other DOE lead program offices with a means for judging the mutual benefits of the tasks under way in related waste packaging areas, and assist in the integration of these tasks as necessary.

Site Characterization. *It is the objective of the Generic Site Characterization* Plan (GSCP) to address the work that will be accomplished during site characterization. Three fundamental questions will be addressed: (1) What questions need to be answered? (2) What is the significance of this information? (Why is it important?) (3) How will the information be obtained?

The GSCP will illustrate how the many tasks of the site characterization all fit together. This is especially important to ONWI, since the tasks are distributed among many technical areas--Engineering Development, Facilities Engineering, Geologic Exploration, Site Qualification, and Technology Development. The plan is perhaps more significant in that the present draft of 10 CFR 60 calls for the submission of such a plan, on a site-specific basis, prior to the time at which such characterization is undertaken. It is the intent that the GSCP provide the basis and format for the development of site-specific SCPs that will be developed later in the program in response to the requirements of 10 CFR 60.

It is recognized that different technological tools will be utilized to answer a specific question in different media, or in some cases different sites in the same medium. It is also recognized that given questions will have varying significance which will depend on the medium and site being addressed. The fundamental questions that will have to be answered in every medium and at every site, however, are those related to the criteria as put

forth in ONWI-33(2). These criteria will form the basis for the topics to be addressed in the GSCP.

Field Tests. This plan defines field testing, explains the role of field testing in repository development, outlines the technical issues to be addressed by field testing, describes the types of facilities needed for field testing, and tells how field testing results are going to be used. To provide a focus and perspective for NWTS field testing efforts, a series of program plans is being formulated to address the field testing needs for various candidate formations for a repository (salt, crystalline rock, argillaceous rocks, tuff, and basalt). The purpose of this first document in the series of six is to provide the general background and foundation for field testing on which subsequent program plans applicable to the specific geologic media named above will be developed.

Repository Sealing. This plan identifies and recommends technology programs that need to be accomplished to fulfill the goals of the NWTS program for repository sealing; recommends methods and schedules for accomplishing the NWTS repository sealing program; shows the interrelationship of other activities within the NWTS program; and classifies current research and development activities directed toward repository sealing and points out the areas that require additional or new studies, and identifies where overlap may occur in the program.

Waste/Rock Interactions Technology (WRIT) Program

The objectives of the WRIT program are (1) to identify and characterize mechanisms of waste form radionuclide release and subsequent geochemical interactions with engineered barriers and natural geologic media, e.g. leaching, solubility, and sorption; (2) to collect data and develop and evaluate the effectiveness of models that predict leaching, sorption, and release processes in the repository and surrounding media; (3) to obtain, through verification studies and documentation, the most acceptable test methodologies for sorption, leaching, solubility limitations, and waste package-geomedia interaction studies; and (4) to support repository site characterization and licensing specifically through data generation, analysis, and predictive model formulation.

The WRIT program began October 1, 1979, as an outgrowth of tasks in the former Waste Isolation Safety Assessment Program (WISAP). The work is managed by the Pacific Northwest Laboratory, which has established

eleven subcontracts in addition to its own facilities to accomplish four major tasks: studies of waste package interactions and nuclide release, studies of geologic media and nuclide interactions, studies of nuclide solution chemistry, and predictive model development.

Waste Isolation Performance Assessment Program (WIPAP)

The purpose of the Waste Isolation Performance Assessment Program, managed by ONWI, is to develop, integrate, and apply modeling technology to evaluate the effectiveness of nuclear waste isolation systems in preventing adverse radiological effects to present and future humans and their environments. WIPAP was established in October, 1979, by combining the modeling activities at the Pacific Northwest Laboratory and INTERA Environmental Consultants, Inc. To accomplish its intended purpose, WIPAP intends to organize present knowledge about isolation system phenomena into a system of models describing isolation system performance and use that technology to support the site qualification, repository design, waste package design, and system licensing activities of the NWTS program.

Peer Review Committees

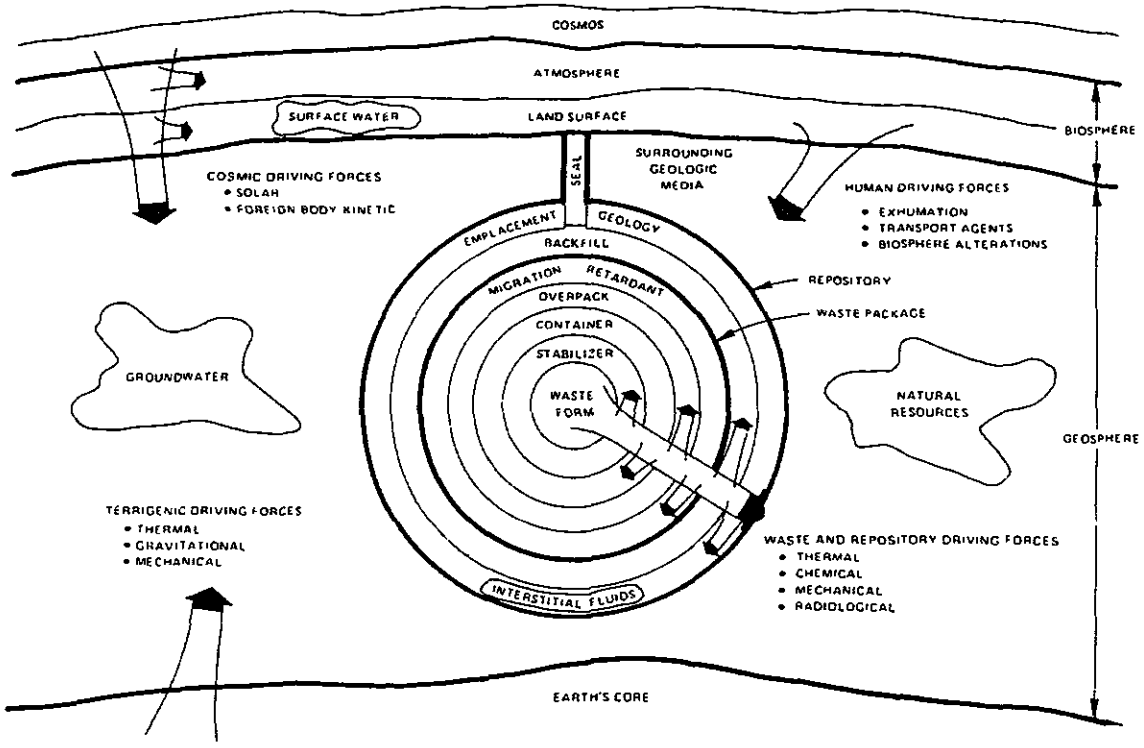
ONWI now has its peer review function fully established. The four review groups are:

(1) **Technical Advisory Committee**—ten individuals with scientific, technical, and management expertise who report to John M. Batch, General Manager of the Battelle Project Management Division. This committee's primary function is to review ONWI's technical program and assess its scope and quality.

(2) **Program Review Committee**—now composed of thirteen persons nominated by national organizations as representative of various social, political, industrial, labor, environmental, and technical interests. The purpose of the committee is to provide the public with the opportunity to review the DOE nuclear waste programs.

(3) **Geologic Review Group**—a group of five experts in the geological sciences who will review critically and provide an independent technical assessment of activities in the area of geologic exploration related to characterization and qualification of potential repository sites.

(4) **Earth Sciences Review Group**—four individuals with technical expertise who review the ONWI earth sciences program's scope and progress to date, critique individual projects, and identify ongoing related research activities which might be useful to the program.



This figure depicts the scope of the modeling problem of the Waste Isolation Performance Assessment Progra (WIPAP). Waste isolation performance assessment involves modeling the combined effects of the driving forces fo change on system components and predicting the effect of resulting phenomena on the system's performance.

Colorado School of Mines (CSM) Experimental Mine, Idaho Springs, Colorado

The CSM is maintaining for ONWI a Thermomechanical Test Facility in their Experimental Mine. The underground room constituting the facility was excavated in granite gneiss using various blasting techniques, and data such as blast damage to the rock and changes in permeability are being collected. TerraTek, Inc., under contract to ONWI, is performing a heated flatjack test on a 1-meter attached block of granite in the facility to evaluate the constitutive properties of the rock. The main purpose of this test is to evaluate the applicability of the flatjack block test as a potential repository site-confirmation test.

Stripa—Sweden

Lawrence Berkeley Laboratories is conducting thermomechanical and permeability tests for ONWI in a granite body at a depleted iron mine at Stripa, Sweden, to evaluate the response of saturated, fractured granite to an imposed heat load. A current part of this effort is a macropermeability experiment designed to test the in situ permeability of the rock on a very large scale.

International Cooperation

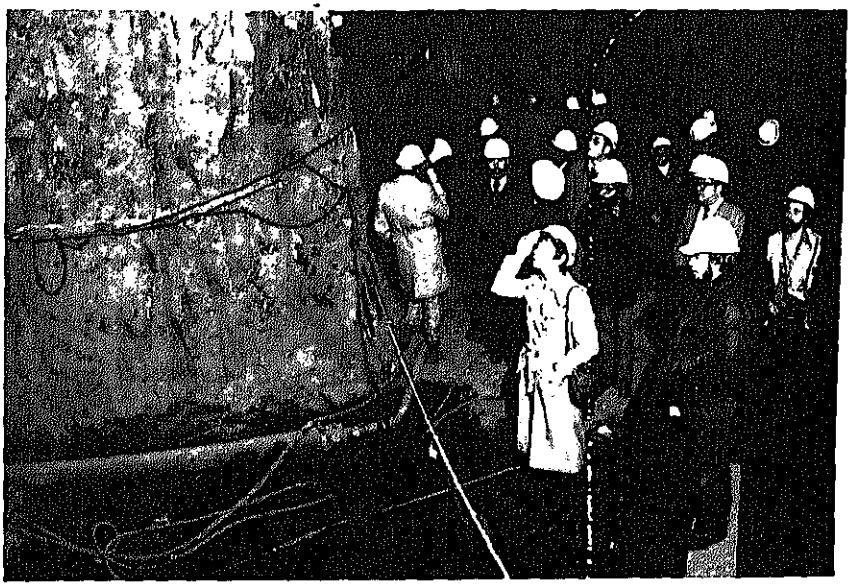
ONWI is preparing a Plan for International Cooperation in Waste Isolation Activities that describes the ongoing and projected efforts within the ONWI program which involve cooperation with other nations or international organizations. The plan will be available in early summer.

WASTE MANAGEMENT MEETINGS

BASALT WASTE ISOLATION PROJECT

More than 500 people attended BWIP's second annual Technical Information Meeting, December 5 and 6, 1979, in Richland, Washington. People from all across the United States gathered to hear 36 speakers discuss the progress of BWIP over the past fiscal year, 1979. BWIP is studying Columbia Plateau Basalts to determine the feasibility of storing radioactive waste in basaltic rock on the DOE Hanford Site, near Richland. Dr. Colin Heath, DOE-Headquarters, Washington, D.C., was the keynote speaker at the luncheon December 5.

The accomplishments and status of the various areas of the project, including hydrology studies, engineering studies, and licensing and public affairs activities, were discussed during the two-day session. The Office of Nuclear Waste Isolation, the Waste Isolation Pilot Plant, and the Nevada Nuclear Waste Storage Investigations– other elements in the NWTS program—also made presentations.



More than 100 persons who attended the Basalt Waste Isolation Project's Annual Technical Information Meeting toured BWIP's Near-Surface Test Facility on the Department of Energy's Hanford Site.

Nearly 580 people attended the first annual information meeting of the National Waste Terminal Storage program, held October 3 – November 1, 1979, in Columbus, Ohio. The meeting (hosted by ONWI) covered a wide range of DOE research projects designed to help determine how, when, and where to permanently dispose of commercially produced U.S. radioactive waste.

About 90 technical papers, presented in two days of three concurrent sessions, summarized research and testing being conducted under contracts with DOE by 82 scientific organizations, engineering companies, and university research facilities throughout the United States. Subjects discussed included the various disposal methods being studied, locations under investigation as possible sites for nuclear waste repositories, descriptions of how a repository might be constructed and operated, and types of waste handling and transportation equipment. Also on the agenda were presentations concerning social, environmental, economic, and safety issues.

Although the meetings were geared to a technical audience, they were open to the public. People who registered included representatives of more than 80 subcontractors participating in the NWTS program; about 100 ONWI staff members; a number of professors; elected and/or appointed local, state, and federal officials; more than a dozen news media representatives; and representatives of interested public and private organizations, such

Speakers at NWTS Information Meeting included (left to right) Dr. Neal E. Carter, General Manager, Office of Nuclear Waste Isolation; Dr. Colin Heath, Director, Division of Waste Isolation, Department of Energy; and Dr. Michael J. Smith, Rockwell Hanford Operations.

Committee) and Citizens Against Nuclear Trash (headquartered in Mississippi). Persons came from five countries in addition to the United States: Canada, England, Germany, Japan, and the Netherlands. A proceedings is available from the Communications Department, Office of Nuclear Waste Isolation, Battelle Project Management Division, 505 King Avenue, Columbus, Ohio 43201.

UPCOMING WASTE MANAGEMENT MEETINGS

International Symposium on Management of Alpha-Contaminated Wastes, Vienna, Austria, **June 2-6, 1980.** Sponsored by International Atomic Energy Agency, Vienna, Austria, and Commission of the European Communities, Brussels, Belgium. Contact: John H. Kane, DOE, Technical Information, MS A1-5216, Washington, D.C. 20545 (301/353-3378 or FTS 233-3378).

American Nuclear Society Annual Meeting, Las Vegas, Nevada, June 8-13, 1980. Sponsored by American Nuclear Society, La Grange Park, Illinois. Contact: Mary Gerry White, Energy Program Division, U.S. Department of Energy, P.O. Box 550, Richland, Washington 99352 (509/942-7285).

International Symposium on Subsurface Space, Stockholm, Sweden. **June 23-27, 1980.** Sponsored by Rockstone 80.

International Conference on Nuclear Waste Transmutation, Austin, Texas. **July 22-24, 1980.** Sponsored by the University of Texas at Austin. Contact: Continuing Engineering Studies College of Engineering, ECJ 2.102, University of Texas at Austin, Austin, Texas 78712.

Coordinated Research Program Committee: Migration and Dispersion of Radionuclides from the Storage of Radioactive Wastes Under Various Conditions in the Terrestrial Environment, Stockholm, Sweden, **August 1980.** Sponsored by International Atomic Energy Agency, Vienna, Austria.

Topical Meeting on Fuel Cycles for the Eighties, Gatlinburg, Tennessee. **September 29—October 2, 1980.** Sponsored by American Nuclear Society, La Grange Park, Illinois, and Oak Ridge National Laboratory, Oak Ridge, Tennessee. Contact: General Chairman Benjamin L. Vondra, ORNL, Building 7601, MS 2, P.O. Box X, Oak Ridge, Tennessee 37830 (615/574-7066 or FTS 624-7066); or Technical Program Chairman M. L. Hyder, Savannah River Laboratory, Aiken, South Carolina 29801 (803/824-6331, ext. 3113).

Workshop on Borehole and Shaft Sealing, Office of Nuclear Waste Isolation, Columbus, Ohio, **May 7-9, 1980.** Contact: F. L. Burns, ONWI.

Energy Agency, Vienna, Austria; Nuclear Energy Agency, 75-Paris, France; and Organization for Economic Cooperation and Development, 75-Paris, France. Contact: John H. Kane, DOE, Technical Information, MS A1-5216, Washington, D.C. 20545 (301/353-3378 or FTS 233-3378).

First National Conference on Management of Uncontrolled Hazardous Waste Sites, Washington, D.C., October 15-17, 1980. Sponsored by the U.S. Environmental Protection Agency, Hazardous Materials Control Research Institute, U.S. Coast Guard, Chemical Manufacturers Association, and National Solid Waste Management Association. Contact: H. Bernard or B. Walcoff (301/585-6587 or 301/587-9393), Hazardous Materials Control Research Institute, 9300 Columbia Blvd., Silver Spring, Maryland 20910.

Third International Symposium on the Scientific Basis for Nuclear Waste Management, Boston, Massachusetts, **November 16-21, 1980.** Sponsored by Materials Research Society. Contact: J. G. Moore, Bldg. 9204-3, Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, Tennessee 37830.

American Nuclear Society Winter Meeting, Washington, D.C., **November 16-21, 1980.** Sponsored by American Nuclear Society, La Grange Park, Illinois. Contact: David G. Pettengill, American Nuclear Society, 555 North Kensington Avenue, La Grange Park, Illinois 60525 (312/352-6611).

Sixth International Symposium on Packaging and Transportation of Radioactive Materials, West Berlin, Germany, **November 16-21, 1980.** Sponsored by American Nuclear Society, La Grange Park, Illinois. Contact: David G. Pettengill, American Nuclear Society, 555 North Kensington Avenue, La Grange Park, Illinois 60525 (321/352-6611).

Waste Management '81, American Nuclear Society Topical Meeting, Tucson, Arizona, **February 22-26, 1981.** Sponsored by American Nuclear Society, La Grange Park, Illinois. Contact: General Chairman Roy G. Post or Program Chairman Morton E. Wacks, University of Arizona, Department of Nuclear Engineering, Tucson, Arizona 85721.

NEW LITERATURE AND TRANSLATIONS

NEW LITERATURE

Copies of reports listed here are generally available from the National Technical Information Service in Springfield, Virginia. Titles of current publications pertinent to nuclear waste isolation may be submitted to the following address for inclusion in future lists: The Ecological Sciences Information Center, Building 2029, P.O. Box X, Oak Ridge, Tennessee 37830.

American Nuclear Society, *High-Level Radioactive Waste Disposal*, ANS Document PPS-1, La Grange Park, Illinois (October 1979).

American Nuclear Society, *Transactions of the 1979 Winter Meeting, Vol. 3, San Francisco, California, November 11-15, 1979*, 986 pp.

Burkholder, H. C., "The Waste Isolation Performance Assessment Program," presented at the 25th Winter Meeting of the American Nuclear Society, San Francisco, California, November 11-15, 1979 (1979).

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Cooley, C. R., "Introductory Comments on the DOE Waste Management R&D Program," presented at the 72nd Annual AIChE Meeting, San Francisco, California, November 25-29, 1979.

Erdal, B. R., et al., *Parameters Affecting Radionuclide Migration in Geologic Media*, LA-UR-79-2992, Revised, presented at International Symposium on the Scientific Basis for Nuclear Waste Management, Boston, Massachusetts, November 26-29, 1979, Los Alamos Scientific Laboratory, Los Alamos, New Mexico.

Jefferson, Robert M., ed., *Program Strategy Document for the Nuclear Materials Transportation Technology Center*, SAND79-1402, Transportation Technology Center, Sandia Laboratories, Albuquerque, New Mexico (July, 1979).

Jenks, G. H., *Effects of Gaseous Radioactive Nuclides on the Design and Operation of Repositories for Spent LWR Fuel in Rock Salt*, ORNL-5578, Oak Ridge National Laboratory, Oak Ridge, Tennessee (December 1979).

King, F. D., "Status of Away-From-Reactor Spent Fuel Storage Program," presented at the 72nd Annual AIChE Meeting, San Francisco, California, November 25-29, 1979.

Klinger, L. M., *Defense Waste Cyclone Incineration Demonstration Program: April—September 1979*, MLM-2672, Mound Facility, Miamisburg, Ohio (December 14, 1979).

Klinger, L. M., B. M. Alexander, and J. E. Todd, *Mound Cyclone Incinerator Preliminary Design Criteria—Batch Mode Operation*, MLM-2646, Mound Facility, Miamisburg, Ohio (September 28, 1979).

McDaniel, E. W., *Cement Technology for Borehole Plugging: An Interim Report on Permeability Measurements of Cementitious Solids*, ORNL/TM-7092, Oak Ridge National Laboratory, Oak Ridge, Tennessee (in press).

Office of Nuclear Waste Isolation, *An Assessment of LWR Spent Fuel Disposal Options*, 3 vols., ONWI-39, Columbus, Ohio (1979).

Office of Nuclear Waste Isolation, *National Waste Terminal Storage Repositories 1 and 2, Cost Estimate Reconciliation Study, Vol. 1, Phase I Report*, ONWI-76, Columbus, Ohio (1979).

Office of Nuclear Waste Isolation, *Storage Room Design Parameters for the ONWI Spent Fuel Disposal Study; Nine Case Studies in Salt*, ONWI-41, Columbus, Ohio (1979).

Park, U. Y., and Yates, K. R., "Nuclear Capacity Projections and Spent Fuel Accumulation," *Power Engineering* 83(12):64-65 (December, 1979).

Phillips, F., F. Feizollahi, R. Martineit, W. Bell, and R. Stouky, *A Waste Inventory Report for Reactor and Fuel-Fabrication Facility Wastes*, ONWI-20, NUS-3314, NUS Corporation, Rockwell, Maryland (March, 1979).

Rushton, R. J. and R. J. Merline, *National Waste Terminal Storage Program: Containment System Concepts for Transporting Type B Quantities of Transuranic Waste*, RFP-2862, Rockwell International, Golden, Colorado (September 1979).

Transportation Technology Center, *Proceedings of the Nuclear Materials Transportation Program Development Seminar: April 18 and 19, 1979*, SAND79-2262, Sandia Laboratories, Albuquerque, New Mexico (1979).

Waite, D. A., and W. E. Newcomb, "Development and Application of Criteria for Siting," presented at the 25th Winter Meeting of the American Nuclear Society, San Francisco, California, November 11-15, 1979 (1979).

Wang, J.S.Y., C. F. Tsang, N.G.W. Cook, and P. A. Witherspoon, *A Study of Regional Temperature and Thermohydrological Effects of an Underground Repository for Nuclear Waste in Hard Rock*, LBL-8271 (Rev.), Lawrence Berkeley Laboratory, Berkeley, California (October, 1979).

U.S. Department of Energy, *Annual Status Report on the Inactive Uranium Mill Tailings Sites Remedial Action Program*, DOE/EV-0060, Assistant Secretary for Environment, Washington, D.C. (December, 1979).

TRANSLATIONS

The following documents have been translated by the Translations Office, Oak Ridge National Laboratory. Prior to submission, records were checked for any previous translations of these articles. The translated documents will be abstracted and indexed for input into the Ecological Sciences Information Center's data base on low-level radioactive waste technology.

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Engelmann, H. J., et al., *Transport System for Radioactive Wastes*, OLS- 80-16A (translated from KFK-2212, pp. 107-127) (1974).

Activities Report

The *Nuclear Waste Isolation Activities Report* is prepared for the Department of Energy by the Office of Nuclear Waste Isolation, which is managed for DOE by the Battelle Memorial Institute in Columbus, Ohio. The *Report* is designed to provide information about DOE's National Waste Terminal Storage program to researchers, decision makers, NWTS program participants, and the general public. The *Report* contains current information on such topics as ongoing research, organizational changes, new technological developments, upcoming meetings, current literature on nuclear waste management, translations of foreign literature, and developments related to NWTS program activities. The *Report* is not a newsletter or periodical issued on a scheduled basis, but rather a report issued occasionally. Previous reports in the series, described below, are available while the supply lasts from the address at the bottom of the page:

Date of Issue	Report Topic
November, 1979	Brief description of DOE waste management programs in general and the NWTS program in particular, 12 pp.

Send comments and requests for copies to:

Beverly A. Rawles, Editor
Nuclear Waste Isolation Activities Report
Office of Nuclear Waste Isolation
505 King Avenue
Columbus, Ohio 43201

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